

REMARKS

Regarding item 5 of the Office Action, a new declaration is enclosed, rectifying the perceived deficiency mentioned by Examiner.

Regarding item 7, the serial number of the divisional application mentioned by Examiner is now included in the preamble to the present specification.

Regarding the objections in items 8 to 10, claims 142, 143 and 150 have been amended to clarify their intended meaning and scope.

Regarding item 11, claim 146 has been deleted.

Examiner will note that claim 1 has been amended to clarify that "two or more... busbars" means two or more busbars at different potential, such that, in use, current flows from one to the other via the interconnect means. It is submitted that one skilled in the art would have read the original claim in this manner anyway, since a "power supply" requires a voltage differential, such as that provided by a power supply voltage and ground. Moreover, attempting to read the original claim as including two busbars at the same potential would make little sense to one skilled in the art, since there would be little to distinguish, say, two busbars of arbitrary size from a single larger busbar. On this basis, it is respectfully submitted that this amendment adds no new matter that was not already implicitly defined in the claims, and requires no further searching or other consideration on Examiner's part.

Claim 1 was also amended to recite "interconnect means" at line 6. Unfortunately, we are unable to tell from our file whether this typographical error appears in the copy on file with the USPTO. In the event this error does not appear, please accept our apologies and ignore this particular amendment.

Similarly, claim 147 has been amended to be dependent upon claim 142; our file copy suggests that this incorrectly refers to claim 412, which is again clearly a typographical error.

Referring to the citations, US 4,899,174 (hereinafter "Newman") discloses a method of making an LED array printhead using TAB bonded wiring. In use (and as shown in Figure 1) a plurality of the printheads are mounted onto a substrate to form a longitudinal pagewidth printhead. Although not explicitly described in Newman, arrays of this type are used in LED-type printers, which operate in a similar fashion to laser printers. The main difference is that instead of sweeping a scanning laser across a drum to alter the charge at selected points on the drum's surface, a pagewidth array of LEDs is used. For the Examiner's convenience, summaries of laser and LED printing can be found at the following independent websites:

<http://www.pctechguide.com/12lasers.htm>

<http://www.techworthy.com/magarchives/hardware/29406.html>

The crucial point is that Newman is directed to pagewidth printing in which light from LEDs is directed onto the surface of a rotating drum to define a print pattern. Toner is applied to the charged portions of the drum's surface, and is transferred to paper. The toner is then fixed by heat.

As acknowledged by Examiner, there is no disclosure in Newman of two or more elongate low resistance power supply busbars.

US 4,635,072 (hereinafter "Hanson") discloses a replaceable thermal inkjet component that uses a TAB connection to supply current to heater resistors adjacent ink reservoirs. Heating the resistors at appropriate times causes a small amount of the ink to vaporise, causing ejection of a droplet of ink onto an adjacent piece of paper. Busbars 66 and 64 are disclosed in Figure 2a. However, the two major elements shown in Figure 2a are mirror images of each other, and the busbars 66 and 64 are both grounding busbars. There is no disclosure of these busbars being "power supply" busbars, let alone that there is any potential difference between them as required by amended claim 1 of the present application. For this reason alone, the busbar feature of Hanson cannot be imported for use with the printhead disclosed in Newman to anticipate the present invention.

Examiner has also proposed that the disclosure of US 6,255,588 (hereinafter "Shepherd") suggests that reduction of undesirable noise is a benefit of busbar usage. With respect, Shepherd is concerned with the supplying power to a relatively large-scale circuit board, such as that which would be used in a personal computer. In such a case, noise reduction might well be a driving factor in

selection of a busbar arrangement. However, such requirements are not necessarily analogous with printhead design. For example, being current driven, inkjet designs such as that shown in Hanson are relatively immune to electrical noise due to, for example, capacitive pickup. The reasoning referred to in Shepherd is therefore not relevant to inkjet printing, and would not be considered relevant to one skilled in the art when considering an inkjet printhead power distribution. For this reason, it is submitted that Examiner's citing of Shepherd as being explanatory of motivation to employ busbars in an inkjet printhead arrangement is not well supported.

Examiner has proposed that it would be obvious for one of ordinary skill in the art to modify Newman to include the busbar of Hanson. As described above, Hanson effectively discloses an inkjet arrangement that uses a ground busbar. It would make no sense to add an additional busbar to Hanson in such a way as would anticipate the present invention as described, since each of the tantalum aluminium resistors is, in effect a separate heating mechanism for respective corresponding ink reservoirs. Attempting to utilise a pair of busbars in Hanson (whether alone or imported into Newman) would result in all the tantalum resistors being heated simultaneously when power is applied. Given the requirement for a droplet on demand from each inkjet orifice in order to allow high-resolution printing, it is clear that there exists no motivation for adding a second busbar of a different voltage potential to Hanson. For this reason, to, it is submitted that the present invention, as defined in the independent claims, is patentable over the citations.

Examiner's attention is also directed to MPEP paragraph 2143.01, where it is stated that "If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)". In the present case, Newman is configured in every way for use as an LED output device for generating electrostatic charge patterns on the surface of a rotating drum. Replacing the LED array of Newman with the inkjet printing mechanism of Hanson would result in an inkjet printer configured to print onto an electrostatic drum.

There are also some practical issues that mitigate against such a substitution. For example, inkjet printers such as Hanson require carefully arranged electrical connections that take into account the need for an ink supply, which must have a predetermined flow capacity as well as incorporating the requisite electrical and thermal insulation. It is respectfully submitted that Examiner has not explained how these factors would be taken into account by one skilled in the art attempting to replace the LED

array of Newman with the inkjet mechanism of Hanson. It is not, for example, explained which features of Newman would be removed to make way for the features of Hanson.

As mentioned above, Newman is a pagewidth LED printhead which outputs pulses of light from each LED as the surface of an adjacent charged drum is rotated continuously past the printhead. Also, the module shown in Figure 3 of Newman is designed to be used with a plurality of other similar modules in parallel. In contrast, the Hanson printhead is designed to be used alone in an inkjet printer. In use, it is moved back and forth laterally across the page being printed, the page being held stationary for each movement and advanced after each lateral sweep is finished. Applicant respectfully submits that one skilled in the art would not be motivated to look to such an inkjet printhead when seeking ways to improve such an LED printhead.

Again, Examiner's attention is directed to MPEP 2143.01, where it is stated that "If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 270 F.2d 810, 123 USPQ 349 (CCPA 1959)". In the case mentioned, the court held that the "suggested combination of references would require a substantial reconstruction and redesign of the elements shown in [the primary reference] as well as a change in the basic principle under which the [primary reference] construction was designed to operate." 270 F.2d at 813, 123 USPQ at 352.)" In the present case, Applicant submits that replacement of an LED module designed for use (with a plurality of other such LED arrays) in a pagewidth LED printhead with an inkjet printer designed for use alone in a scanning inkjet printer dramatically changes the operation of the LED printhead, whilst requiring "substantial reconstruction and redesign" of the LED printhead. For this further reason, it is submitted that the present invention as claimed is patentable over the cited art.

Turning to the claims dependent on claim 138, claim 139 defines that the busbars are disposed to extend parallel to the printhead. As explained above, since there is only one busbar disclosed in Hanson (although it is replicated on both sides of the head), so there is no disclosure of interconnections between two busbars of the type defined in claim 1 and the voltage supply points. It is submitted that claim 2 is therefore patentable over the citations.

Regarding claim 141, it is defined that the TAB film electrically connects with the busbars by means of correspondingly sized noble metal deposited strips. Examiner contends that this feature is disclosed in Newman. Applicant disagrees that such noble metal strips are so disclosed, and would appreciate it if Examiner could indicate where it is believed there is such disclosure in Newman. The only reference to deposition of metal in Newman is the discussion of border area 48, which is unrelated to any busbar connection (there is no busbar in Newman). In any event, it is clear from Figure 1 that this border is removed from the TAB construction before assembly to form the print head and cannot, therefore, be considered as relevant to any prospective busbar connection.

Even if one considered the busbar connection of Hanson relevant to the disclosure of Newman, the only busbar disclosed in Hanson appears to be connected to the relevant circuitry by way of ordinary lithographic integrated circuit manufacturing principles. There is no disclosure of connecting interconnect means to the busbar by way of a strip of noble metal on a TAB film. For all these reasons, it is submitted that claim 141 is patentable over the cited art.

Regarding claim 145, Examiner proposes combining features from five unrelated documents in order to show how the present invention can be anticipated. Whilst Applicant appreciates that more than two documents can be used to source features when seeking to show a claim is anticipated, it is respectfully submitted that the likelihood one skilled in the art would look to five separate documents is exceedingly low. Newman relates to a pagewidth LED array printhead; Newman to an inkjet component for use in a reciprocating printhead arrangement; Shepherd to an arrangement for supplying power from a busbar to a circuitboard in a completely non-printing environment; Ng to improving low spatial frequency artefacts in a print system; and Neyer to a double sided electrical interconnect that enables connection of two different systems using different sides of the interconnect. Applicant strongly argues that it would utterly not be obvious to look to such disparate sources to improve Newman in the way defined in claim 145. Regarding Meyer, Examiner suggests that it would have been obvious to replace the Tab film in Newman with double sided TAB film to reduce costs. However, Examiner has not appreciated that there is more to the use of double sided film than mere cost. In the present case, double sided film is not used to reduce costs – it is used to enable a novel power distribution arrangement in a way that provides layout advantage over the prior art.

It should also be noted that Meyer discloses double sided TAB film that is used to provide two separate sets of connections. As mentioned in the abstract, one side provides connections for a printer

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controller, whilst the other provides connections for electrically active components. In contrast, the present arrangement as claimed in claim 145 is concerned with supplying power via a two-sided TAB film. In the preferred embodiment, it can be seen how the two sided TAB film allows an advantageous routing of power from the noble metal strips through vias to the lateral power lines, and thence to the printhead itself. Such an arrangement, in the form claimed, is not at all suggested by any of the prior art.

Applicant turns to Examiner's rejection of claims 147 and 148 on the basis that the limitation "the printhead" does not add further limitation to the "power distribution arrangement". Whilst applicant concedes that such a limitation exists, it is respectfully submitted that adding limitations related to the printhead is appropriate in the present circumstances because it implicitly adds limitations to the power distribution arrangement. For this reason, it is respectfully submitted that claims 147 and 148 are allowable.

Similar comments apply in relation to claims 150, 151 and 154. However, if Examiner considers it necessary to gain allowance of those claims, Applicant would consider amending those claims to define a power and ink distribution arrangement. The claims would either refer to the power distribution arrangement of one or more previous claims, or would be independent and include the features of earlier claims.

It is submitted that other claims dependent on claim 138 are also allowable in their own right, as well as their dependency upon one or more allowable claims.

Very respectfully,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE**In the Specification:****In the Claims:**

Claims 138, 142, 143, 147, and 150 have been amended as follows:

138. (Amended) A power distribution arrangement for an elongate inkjet printhead of a kind having a plurality of longitudinally spaced voltage supply points, said power distribution arrangement including:

two or more elongate low resistance power supply busbars, the busbars, in use, being at relatively different potentials; and

interconnect means to connect a respective selected pluralities of said voltage supply points to each of said busbars.

142. (Amended) A power distribution arrangement according to claim 138 wherein said interconnect means also includes a plurality of control lines for connection to selected others of said voltage supply points on said printhead.

143. (Amended) A power distribution arrangement according to claim 138 wherein said flexible interconnect means is in the form of one or more printed circuit boards which connect directly to said busbars, with wire bonds connecting the printed circuit boards to said printhead.

147. (Amended) A power distribution arrangement according to claim ~~412~~ 142 wherein the printhead is in the form of a printhead chip manufactured by a MEMS processing technique.

150. (Amended) A power distribution arrangement according to claim 149, wherein said ink supply unit including:

— a slot for insertion of said printhead; and

— a series of elongated chambers for the storage of separate color inks, said chambers being interconnected with said slot for the supply of ink to said printhead; wherein:

said busbars are being connected disposed along said ink supply unit; and

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the interconnect means ~~being in~~ take the form of a tape automated bonding strip similarly disposed along the outside of said ink supply unit having a series of control lines along one surface thereof for mating with corresponding external series of control lines, said tape automated bonding strip further having a repeating series of interconnects to said printhead, said interconnects interconnecting said control lines and said busbars to said printhead.

Claim 146 has been cancelled.

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